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ABSTRACT

This experiment was an attempt to replicate a sound discrimination training procedure reported by Elkonin (1963). Eight kindergarten subjects were given a training list composed of five words made up of nine sounds. Experimental subjects learned to discriminate the sounds making up the words with aid of pictures representing the words as well as tokens to represent the sounds. Control subjects did not receive picture and token training. There were no significant differences between the experimental and control subjects on training or transfer lists. This failure to replicate was discussed in terms of age of subjects, possible differences between American and Soviet children, and time spent during training. It was suggested that future research should focus on younger children. (Author)

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Technical Report No. 202

Analysis Training: Failure to Replicate Elkonin

by
Larry Wilder

Report from the Project on
Letter-Sound Relationships and the
Development of Reading Skills

Wisconsin Research and Development
Center for Cognitive Learning
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Statement of Focus

The Wisconsin Research and Development Center for Cognitive Learning focuses on contributing to a better understanding of cognitive learning by children and youth and to the improvement of related educational practices. The strategy for research and development is comprehensive. It includes basic research to generate new knowledge about the conditions and processes of learning and about the processes of instruction, and the subsequent development of research-based instructional materials, many of which are designed for use by teachers and others for use by students. These materials are tested and refined in school settings. Throughout these operations behavioral scientists, curriculum experts, academic scholars, and school people interact, insuring that the results of Center activities are based soundly on knowledge of subject matter and cognitive learning and that they are applied to the improvement of educational practice.

This Technical Report is from the Project on Variables and Processes in Cognitive Learning in Program 1, Conditions and Processes of Learning. General objectives of the Program are to generate knowledge and develop general taxonomies, models, or theories of cognitive learning, and to utilize the knowledge in the development of curriculum materials and procedures. Contributing to these Program objectives, this project has these objectives: to ascertain the important variables in cognitive learning and to apply relevant knowledge to the development of instructional materials and to the programming of instruction for individual students; to clarify the basic processes and abilities involved in concept learning; and to develop a system of individually guided motivation for use in the elementary school.

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Abstract

This experiment was an attempt to replicate a sound discrimination training procedure reported by Elkonin (1963). Eight kindergarten Ss were given a training list composed of five words made up of nine sounds. Experimental Ss learned to discriminate the sounds making up the words with the aid of pictures representing the words as well as tokens to represent the sounds. Control Ss did not receive picture and token training.

There were no significant differences between the experimental and control Ss on training or transfer lists. This failure to replicate was discussed in terms of age of Ss, possible differences between American and Soviet children, and time spent during training. It was suggested that future research should focus on younger children.

I
Introduction

Do children learn to read by discriminating whole words (analytic method) or do they learn to isolate and identify separate sounds within a word (letter-sound correspondences)? While this question goes largely unanswered (Chall, 1967), reading programs based on both explanations exist. D. B. Elkonin (1963), a Soviet reading researcher, has taken the position that, in order to read, a child must "hear and distinguish the separate sounds in words" (p. 165). Since children have considerable difficulty isolating the sounds which make up a word (Zhurova, 1963), it would seem that training procedures facilitating the acquisition of this skill would be desirable.

Elkonin (1963) has proposed a system for training children to identify letter-sound correspondences. Based on a broad theory of one of his colleagues, Elkonin has proposed that "mental actions" (i.e., skills) develop through the following stages:

> (1) establishing a preliminary idea of the task; (2) mastering the action with objects; (3) mastering the action on the plane of speaking aloud; (4) transfer of the action to the mental plane; (5) final establishment of the action. [P. 166]

Essential to this theory is the child's manipulation of objects, and Elkonin maintains that "mastery of sound analysis directly on the basis of uttering words, i.e., on the plane of speech, is very difficult for children and does not lead to positive results" (p. 166). Thus, there appear to be three levels necessary for the acquisition of letter-sound correspondence skills: the practical plane, the plane of speech, and the intellectual plane.

In order to train sound analysis skills, then, it is first necessary to give the children practical experiences with the word and sounds which make it up, rather than expecting the speaking-listening context to be adequate. Elkonin accomplished practical plane by showing the child a picture and having the child say its name. Next the child was given tokens (i.e., plastic chips) to represent the individual sounds comprising the word. Directly below the picture was a "schema," or a series of squares representing the number of sounds making up the words. The child was shown how to place the tokens in the squares while saying each sound. After this phase was accomplished, the schema was withdrawn, and finally the tokens.

The plane of speech was achieved when the picture was removed, the child was presented the word aurally, and he repeated it and named all the sounds. The intellectual plane was accomplished when the child was presented the word, and without saying it was able to (a) name all the sounds in the word, (b) tell how many sounds were in each word, and (c) tell in what part of the word one or another sound had place.

Elkonin (1963) reported that the practical plane was highly effective for advancing children to the intellectual plane. With the total training program (three phases), children were able to master the training words, and this initial training transferred to a new list of words. Without the practical plane training (i.e., no picture, tokens, or schema; training beginning with the plane of speech), children were unable to master the training list, and there was no transfer effect.

The present experiment was an attempt to replicate this training procedure. While one group of kindergarten children was administered all three training phases, the control group received only speech training. It was expected that the experimental group (total training) would be superior to the control group (speech alone) in both training and transfer words.

II
Method

Subjects

Eight kindergarten Ss were arbitrarily selected to participate (mean age = 5 years, 9 months). The only restriction imposed was that S could not have previously participated in a sound discrimination experiment. Four Ss were assigned to the speech alone condition and four to the total training condition.

Stimulus Materials

The training list was composed of five words (bunny, comb, key, money, seal) made up of nine sounds (b, k, l, m, n, s, i, ou, e), with three words monosyllabic and two bisyllabic. In the transfer list in the total training condition, pictures representing the five words were used. At the bottom of each picture was a schema composed of as many small black squares as there were sounds in the word represented by the picture.

Procedure

Each child was brought individually to a private room. The training for the total training group was in four phases. In Phase I (practical plane) E showed S a picture representing one of the five training words, named the picture, and pronounced the sounds making up the word. As each sound was pronounced, a token was placed in the schema directly below the picture. The S then was instructed to repeat E's actions (Ia). When all five words were segmented correctly twice by S, the same procedure was employed again but without the aid of E (Ib). After two perfect trials in this manner, the tokens and the picture were withdrawn. In Phase II (plane of speech), the child was presented with the word aurally, and after repeating it, named all the sounds. After two perfect trials, training was begun in Phase III (intellectual plane). The child was presented the word, and without saying it was prompted to: (a) name all the sounds in the word (two perfect trials to criterion), (b) tell how many sounds were in each word (twice), and (c) tell whether a randomly chosen sound occurred first or last in a word. Phase IV was the test phase, in which the five training words were mixed with five new words (bowl, fish, luck, highway, sunny), three of which were comprised of the same sounds making up the training list, and two of which were made up of sounds not in the training list (i.e., fish and highway).

The speech alone group did not receive picture, token, and schema. Phase I consisted of E naming the word and segmenting it. The child was then asked to repeat the word and segment it. Phases II, III, and IV were the same as for the total training group.

The speech alone group received a minimum of 10 trials with the five words, and the total training group, who received additional trials with the tokens and the schema, were administered a minimum of 14 trials. The words were randomly ordered within each trial. The final test, comprised of both training and transfer words, was administered once for naming the sounds, once for telling how many sounds made up each word, and once for designating whether a sound had place first or last within a word (the order of word presentation was different for each test).

A total of five 20-minute sessions was devoted to each S, and each advancement in training was based on two perfect trials on the preceding task.

III
Results

Table 1 shows the trials to criterion within each of the training phases.

Table 1

Trials to Criterion (Including Criterion Trials)
for All Ss

	Training Phase S Age yrs.mos.	Ia	Ib	Ic	II	IIIa	IIIb	IIIc	TEST
TOTAL TRAINING	1 5 10	2	15	5	2	2	2	2	X
	2 5 10	2	14	2	2	2	2	2	X
	3 6 3	2	15	2	2	2	2	3	X
	4 5 7	3	5	6	2	did not comp-lete			no test
SPEECH ALONE	5 6 1	2	not admin-istered		18	2	2	2	X
	6 6 3	2			did not comp-lete				no test
	7 5 6	3			did not com p-lete				no test
	8 6 4	3			13	3	4	5	X

One S in the total training group did not complete training, while two failed to finish in the speech alone group.

Inspection of Table 1 reveals that only Phase Ib for the total training group and Phase II for the speech alone group involved excessive training trials. Each of these phases followed the phase wherein S imitate E; i.e., the difficult training trial appears to be S's first attempt to segment the word himself with no prompting by E. If S learned this task, he went on through the test phase in few trials (except for S 4).

Table 2 represents an item analysis of the correct responses within Phases Ib and II of the total training and the speech alone groups, respectively. The monosyllabic words produced more correct responses than did the bisyllabic words, and within the mono- and bisyllabic word groups, the items were of equal difficulty.

Table 3 indicates that there were minimal differences in performance between the total training and the speech alone groups on the training and the transfer words. While both groups averaged high on the test phase with the training words (total training = 13.67, speech plane = 12.5), neither group showed transfer of training, although "in what place" (P) scores were high for both groups.

Table 2
Correct Responses on Phases Ib and II

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	ΣX
	S* 1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	2	1	0	0	1	1	1	1	1	0	1	1	1	1	1	1	1	
KFY	3	0	0	0	1	1	1	1	0	1	1	1	1	1	1	1	1	
	5	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	1	
	8	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	1	
	ΣX	2	1	1	3	3	4	3	3	4	4	4	4	4	4	5	5	54
	1	0	0	0	0	0	0	1	0	1	0	0	0	0	1	1	1	
	2	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1	
BUNNY	3	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	
	5	0	0	0	0	0	0	0	0	1	0	0	1	1	1	1	1	
	8	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	
	ΣX	0	0	0	0	1	0	2	1	2	0	0	1	2	4	5	4	22
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	2	1	0	0	0	0	1	1	0	0	0	1	1	1	1	1	1	
SEAL	3	0	0	1	0	1	0	0	1	0	1	0	1	0	1	1	1	
	5	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	
	8	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1	1	
	ΣX	2	1	2	1	2	3	3	4	3	3	4	5	4	5	5	5	52
	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	
	2	0	0	1	0	1	0	0	0	0	0	0	0	1	1	1	1	
MONEY	3	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	
	5	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	
	8	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	
	ΣX	0	0	1	0	1	1	0	1	0	1	0	1	3	4	4	5	22
	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	
	2	0	0	0	1	1	1	0	1	0	1	1	1	1	1	1	1	
COMB	3	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	
	5	1	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	
	8	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	
	ΣX	1	1	1	3	4	4	3	4	3	4	5	4	3	4	5	5	54
TOTAL		5	3	5	7	11	12	11	13	12	12	13	15	16	21	24	24	204

*S 1, 2, 3 = Ib Total Training
S 5, 8 = II Speech Alone

10 11

Table 3

Test Words
(Total Correct for All Items and Ss)

		TOTAL TRAINING									SPEECH ALONE						
		1			2			3			5			8			
		S	NS	P*	S	NS	P	S	NS	P	S	NS	P	S	NS	P	ΣX
TRANSFER TRAINING	Seal	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	14
	Key	1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	12
	Comb	1	0	1	1	0	1	1	1	1	0	1	1	1	1	1	12
	Money	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	13
	Bunny	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15
	ΣX	5	3	5	4	4	5	5	5	5	4	3	5	4	5	4	66
								X = 13.67						X = 12.5			
	Bowl	0	0	1	0	0	1	0	0	1	0	1	1	0	0	1	6
	Fish	0	0	1	0	0	1	0	1	0	0	0	1	0	0	1	5
	Luck	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2
	Sunny	0	0	0	0	0	1	0	0	1	0	0	1	0	1	1	5
	Highway	0	1	1	0	1	0	0	1	0	0	0	0	0	1	0	5
	ΣX	0	1	3	0	1	3	0	2	3	0	1	4	0	2	3	23
								X = 4.33						X = 5.9			

* S = Sounds
NS = Number of Sounds
P = Place

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IV
Discussion

These results fail to support the hypothesis that total training (training with pictures, tokens, and schema) is superior to speech alone training. However, several factors could have contributed to this failure to replicate. First, only eight subjects participated in the experiment. While two did not complete the speech alone training, one failed to complete the total training and procedure. With a larger sample it could be determined whether or not this difference is reliable. Also, a larger sample might detect any differences in trials to criterion for phase Ib of the total training group and phase IIa for the speech alone groups. Since these were the only phases which involved excessive training trials, a larger sample might support the hypothesis that total training is superior to speech alone training. However, it is obvious from the children tested that there appeared to be no qualitative difference between groups receiving total training versus speech alone.

Second, there could be age and/or educational differences between the American and Soviet children tested. If there is such a difference, then younger children would have to be used with the total training procedure, since it is clear from this attempt that the children could perform equally well with speech alone as with total training. It could be, however, that younger children could benefit from total training.

Third, it is difficult to replicate Soviet research (e.g., Wilder, 1969) from the details available about apparatus, procedures, and so on. Perhaps a more attractive and elaborate token and schema apparatus would have been helpful. Also, extended training sessions with the children could have been more effective than this limited program. Again, it is not known from the Soviet reports exactly what was done in training the children.

Going beyond these limitations, it can be concluded that the experimental subjects did not benefit from total training. It would seem that these subjects had already developed beyond the need for such training. That is, they could accomplish the sound discrimination task on the plane of speech. This result suggests that speech possesses the necessary signalling property and that manipulation of material objects representing the sounds which make up a word is unnecessary. Whether or not such a stage in the child's development exists must be determined by examining younger children. It is recommended that further research be directed at studying younger children rather than increasing sample sizes to detect statistical differences. Although such differences might be observed, it would be difficult to imply that total training should be employed in teaching sound discrimination.

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Appendix

TRAINING PROCEDURES FOR MATERIALIZED
ACTION AND SPEECH TRAINING GROUPS

TOTAL TRAINING (Experimental)

Practical Plane

I. a. "See this picture? This is a (Key). Now watch what I do. Key, /K/ - /i/."
Place tokens for each sound. "Can you put a block in the square for each sound in (Key)?"
Two perfect trials to criterion.

I. b. "Now you do it without my help. I'll say the word, then you say the word and put the blocks in for each sound. (Key)."
If no response: "What did you do before? Remember?" Prompt child to the point of repeating Ia, but keep at him until he can do this task himself.
Two perfect trials to criterion.

I. c. Remove cards with squares; lay out pictures with no squares underneath.
"Now we'll play without the squares. Say the word after me, put the blocks for each sound in the word wherever you want. (Key)."
Two perfect trials to criterion.

Plane of Speech

II. Take away pictures and blocks.
"Now we'll play without these. I'll say the word, then you say the word and tell me its sounds. (Key)."
Two perfect trials to criterion.

Intellectual Plane

III. a. "Now I'll say the word and you just tell me its sounds. (Key)."
Two perfect trials to criterion.

III. b. "Now can you tell me how many sounds are in each word? Watch: Key, /K/ - /i/. That's two sounds."
Two perfect trials to criterion.

III. c. "Now I'll say one of the sounds in Key. /K/. Is that sound in the front or back of the word?"
Two perfect trials to criterion.

SPEECH ALONE (Control)

Plane of Speech

I. a. "I'll say a word, Key. These are its sounds, /K/, /i/. Can you do that? Key, /K/ - /i/."
Two perfect trials to criterion.

II. "Now I'll say the word; you say the word and tell me its sounds. (Key)."
Two perfect trials to criterion.

Intellectual Plane

III. a. "Now I'll say the word and you just tell me its sounds. (Key)."
Two perfect trials to criterion.

III. b. "Now **can you** tell me how many sounds are in each word? Watch: Key, /K/ - /i/. That's two sounds."
Two perfect trials to criterion.

III. c. "Now I'll say one of the sounds in Key. /K/. Is that sound in the front or back of the word?"
Two perfect trials to criterion.

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